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ABSTRACT

The effects of a budgetary formula change on 39 public colleges and universities in Virginia were assessed. As a state reaction to declining resources, the sample of 15 senior-level colleges and 24 community colleges had undergone a policy change for the 1978-1980 budget to make an adjustment upward in the student-faculty ratio. Attention was directed to three concerns: (1) the impact of the student-faculty ratio on instructional costs per student; (2) responses by the schools to the formula change, including instructional expenditures and the number of degree programs offered; and (3) institutional responses of senior-level colleges compared to community colleges. The conceptual framework for the analysis was derived from the "revenue theory of cost" (Bowen) and the "threshold level" of enrollment (Maynard). The primary data source was the Higher Education General Information Survey. As a result of institutional responses to revenue distress, per unit costs began to fall in both college sectors 2 years after the budgetary adjustment. Initially, per unit costs continued to rise as colleges were slow to adapt and were unwilling to retrench faculty. Instructional expenditure and number of degree programs per 100 full-time equivalent students were significant predictors of per unit instructional costs. (SW)

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INSTITUTIONAL RESPONSES TO CHANGE IN A BUDGETARY FORMULA FOR INSTRUCTION: EVIDENCE FROM COLLEGES AND UNIVERSITIES IN VIRGINIA

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INSTITUTIONAL RESPONSES TO CHANGES IN A BUDGETARY FORMULA FOR INSTRUCTION: EVIDENCE FROM COLLEGES AND UNIVERSITIES IN VIRGINIA

Budget formulas are of central importance in the appropriation process for public higher education. Regardless of their stated purpose, formulas ultimately have a significant influence upon the amount of state monies individual colleges and universities receive. Of the more than 20 states using budget formulas (Kentucky Council on Higher Education, 1977), most states use them for determining requests for resources (Hale and Rawson, 1976). However, formulas are also used for determining the final appropriation for a state system of higher education as well as for individual institutions (Gross, 1973).

Budgetary formulas first assumed a prominent position in the public higher education appropriations process during the decades of the 1950's and 1960's. These trends were toward: (a) greater centralization of control over state funds (Kellogg, 1974); (b) increased political complexities (Meissenger, 1976); (c) more legislative and executive mandates for fiscal accountability (Hale and Rawson, 1976); (d) requests for more rational budgeting (Michigan Department of Education, 1976); and, (e) the move by higher education to command an increasingly larger percentage of state funds. Several trends contributed to a political climate receptive to and occasionally demanding increased accountability for higher education; concomitantly, conditions in higher education contributed to adopting enrollment driven

formulas. Statewide coordinating and governing boards became the normative model of public governance of higher education. This development was accompanied by increased standardization of financial accounts for institutions (Miller, 1964) and refined cost analysis between programs (Bogue, 1977) which made institutional comparisons possible. Further, state boards with advisory or regulatory power for budgetary review (Adams, Hawkins, Kingston and Schroeder, 1976) required a means of enhancing equity (Gross, 1973) and objectivity (Spence, 1976) in the institutional allocation process. In documenting the emergence and widespread use of formulas, Miller (1964) noted that the increasing level of higher education appropriation requests was of great concern to state officials. This matter was further compounded by a need to achieve equity which meant similar expenditures for comparable programs by level (Academy for Educational Development, 1979) or by common funding for common activities (Kentucky Council on Higher Education, 1977) in states with insufficient resources for postsecondary education (Moss and Gaither, 1976). Moreover, some state officials speculated that the use of more objective requests, such as those based upon budget formulas might have the effect of increasing funds to be appropriated for colleges and universities (Stumph, 1970). From a slightly different vantage, budgetary formulas were perceived as a compromise between a demand for accountability and the protection of autonomy (Gross, 1974).

Many states adopted enrollment-driven formulas when revenues were insufficient to support institutional needs (Miller, 1964) with the intent of justifying additional budgetary requests and expenditures

(Stumph, 1970). Initially, these formulas were successful in generating additional funding. However, as state resources became more scarce while requests for state resources exceeded available revenues, formulas evolved into budgetary control mechanisms. For example, they were often adjusted upward by states increasing the student-faculty ratio in order to align institutional funding requests with available resources (Caruthers, 1977). In spite of a salient pattern of increasing student-faculty ratios in states employing formula funding (Meisinger, 1976), there have been few studies examining the impact over time of a budgetary formula change on colleges and universities. Given the importance of budgetary formulas to public higher education, research is needed that will improve the understanding of the effect of state budgetary cutbacks upon institutional operations (Collier, 1979). A clear understanding of the effects of a change in a budget formula would seem to be extremely useful to state policy makers and educational decision makers in order to plan and to implement appropriate responses to revenue decline, responses that may be in the best interests of higher education.

The purpose of this study was to determine the effects, over time, of a budgetary formula change on public colleges and universities in one state, the Commonwealth of Virginia. Specifically, three research questions guided the study:

1. How did a change in the student-faculty ratio used in a state budgetary formula affect instructional costs per student unit and its predictors?

2. What were the various institutional responses such as the instructional expenditure proportion and the level of institutional complexity, and how did they affect per unit instructional costs?
3. What were the similarities and differences between the senior-level institutions sector and the community college sector in their institutional responses and in the affects on instructional costs per student unit?

Conceptual Framework

The conceptual framework for this study is derived from two principles from finance and economics. The first is the "revenue theory of cost" which posits that educational costs per student are related to the amount of institutional revenues generated (Bowen, 1980). This theory offers a useful perspective for examining institutional responses to and consequences of changes in budgetary allocations produced by larger student-faculty ratios. Underpinning this model is the assumption that institutions spend all the revenues they generate. With an enrollment-driven formula, costs per student unit should decrease if there are less available revenues. Therefore, since an increase in the student-faculty ratio would reduce the amount of revenues allocated to an institution when enrollment is held constant, instructional cost per student unit would be expected to decrease. But, less certain, is the issue of whether per unit costs fall quickly and evenly with revenue distress as the revenue theory of cost would suggest. Complicating this issue, however, is the information that some costs are "sticky"

(Dickmeyer, 1980) during revenue distress conditions and cannot be immediately reduced and the type of institutional response to revenue distress also influences the ability of institutions to rapidly adjust their per unit costs (Zammuto, Whetten, and Cameron, 1983). Yet, information about these matters is essential in order to understand institutional responses to revenue distress and their potential consequences for the capacity of an institution to meet its philosophical and educational objectives.

The second principle is the "threshold level" of enrollment (Maynard, 1971). After attempting to describe the relationship between educational costs per student and institutional size, Maynard found that larger institutions have better chances of achieving economies of scale. Extremely small colleges or universities lack sufficient enrollment to reach a threshold level due to the minimum number of programs and faculty necessary to operate an effective institution. Once a threshold level of enrollment is obtained, the long-run average cost curve quickly flattens over a wide range of enrollment.

In recent research on formula funding, Brinkman (1981) found institutional complexity to be more important than institutional size or staffing ratio for explaining the variance (between institutions) in instructional costs per student unit. In related research, McLaughlin, Montgomery, Smith, Mahan, and Broomall (1980) found a positive relationship between the number of faculty and institutional complexity. Complexity was more important than size for explaining per unit costs. The staffing ratio was the most significant variable

explaining the variance in instructional costs per student unit. Therefore, an increase in the student-faculty ratio may precipitate modifying the level of staffing as one response to revenue distress. According to the findings of McLaughlin et al. (1980), if the number of faculty is related to institutional complexity, any change in the staffing level could affect institutional complexity. Therefore, a decrease in instructional costs per student unit from an upward revision in the student-faculty ratio could affect institutional complexity by modifying the continued growth in this feature of educational organizations as identified by Blau (1974). However, due to its strong relationship with per unit costs, complexity may still be more important, especially if it is not altered, in explaining the behavior of instructional costs.

Increases in the budget formula lead to revenue distress. In response, an institution may become more efficient by requiring more productivity from its faculty. This could counteract the effects of revenue distress as suggested by Zammato (1982). However, research by Gilmartin (1981) suggests that this change in policy may not affect all sectors nor all institutions in the same sector evenly. Therefore, there is the possibility of an interaction effect between educational sectors, especially if some are better able than others to respond to revenue distress created by the efforts of a state to economize.

Stated differently, an upward adjustment in a budget formula leads to revenue distress. This exerts pressure for institutions to reduce instructional costs per student unit in accordance with Bowen's

(1980) theory. In response, an institution may eliminate programs and/or reduce its staffing level, a change which affects the threshold level and the range where economies of scale are achieved. Other responses may be initiated, such as salary distress, which affect neither complexity nor an institution's threshold level. Therefore, the relationship among the individual predictor variables as well as the relationship between the predictor variables as a group and the criterion variable of instructional costs per student unit may change. In contrast, institutional responses to revenue distress may counteract its effect. However, certain responses may be more effective in reversing a declining trend. Further, the same responses may not be available to all institutions. Lastly, institutional responses may or may not counteract revenue distress, which ultimately influences the ability of an institution to fulfill valued objectives. In short, despite the importance of institutional responses to reduce costs, it has not been established empirically how per unit costs change with revenue distress as the revenue theory of cost would suggest or the impact of these institutional responses.

Sample

The sample consisted of the 39 public colleges and universities in the Commonwealth of Virginia. Fifteen were senior-level institutions and 24 were community colleges. These colleges were particularly well suited for the study; they had been subjected to a policy change for the 1978-1980 biennium budget to make an adjustment upward in the student-faculty ratio as a state reaction to declining resources.

Sources of Data

The primary data source was the Financial and Salaries, Tenure and Fringe Benefits of Full-Time Instructional Faculty Survey statistics data compiled from the Higher Education General Information Survey (HEGIS). Other institutional financial and enrollment data were collected from Virginia higher education institutions and state agencies. Information was gathered for the period from 1975-1976 to 1980-1981.

Variables

The dependent variables employed in the study were:

Instructional costs per student unit. The level of instructional expenditures per full-time equivalent student unit.

Institutional complexity. The number of degree programs offered per 100 full-time equivalent students.

The independent variables employed in the study were:

Size.

The level of full-time equivalent students.

Staffing ratio.

The number of full-time equivalent students per full-time faculty member.

Average faculty salary.

The level of educational salaries for full time faculty per full-time faculty member.

Graduate student proportion.

The level of full-time equivalent graduate students to total full-time equivalent students.

Instructional expenditures proportion.

The level of instructional expenditures to total educational and general expenditures.

Total institutional revenues.

The total level of an institution's educational and general revenues.

Time when there was a change in policy.

The change in the budgetary formula for instruction which occurred during the 1978-1979 academic year when there was an increase in the student-faculty ratio.

Nonlinear trend for size.

The square of the size variable to reflect the nonlinear trend of size in relation to instructional costs per student unit.

Interaction of time and sector.

The interaction of the two independent variables of time when there was change in policy and sector. A significant interaction would indicate that the relationships of the independent variables with the dependent variable did not behave the same in both sectors after the change in budgetary policy.

Sector.

The two sectors analyzed in this study which were the senior-level institutions sector and the community college sector.

Measurement Considerations

Prior to conducting the statistical analyses, measures were taken to increase the precision and consistency of selected variables.

Enrollment data were converted to full-time equivalent (FTE) "student units" (Bowen, 1980) for comparability across institutions. Since this study employed longitudinal financial data, the effect of inflation had to be removed in order to determine if spending kept pace with inflation. Also, there was a need to deflate revenues to determine the trend in the real purchasing power of funding sources. To do this, a weighted composite index was constructed based on price indices from the Higher Education Price Index (Halstead, 1975). This composite index was used

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Insert Table 1 About Here

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to factor out inflation from per unit instructional costs and state appropriation revenues. Furthermore, to reflect the faculty perspective, the Consumer Price Index was used to factor out inflation from average faculty salaries. It was also necessary to remove fringe benefits from expenditure data and state revenue appropriations for the academic years 1979-1981 to achieve consistency in their treatment with academic years 1976-1978 when they were centrally appropriated and were not reflected in institutional expenditure accounts nor state appropriations to institutions.

Statistical Procedures

Correlational and pooled cross-sectional time-series multiple regression analyses were used to analyze the predictor variables, including time, that explained the variance in instructional costs per

student unit and in institutional complexity. Three series of analyses were conducted: (a) all institutions; (b) four year colleges and universities; and (c) community colleges. Dummy variables for cross-sectional observations were initially included in order to remove the variance in the dependent variables due to repeated measures. To select significant predictors of per unit instructional costs, stepwise multiple regression was employed.

Findings

Table 2 summarizes the findings from the multiple regression analysis of the relationships between the two dependent variables, instructional costs per student unit and institutional complexity, and the independent variable time, which represented the change in the budgetary formula as well as the means of the dependent variables before

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Insert Table 2 About Here

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and after the policy change. The significance levels shown were determined after coding in the dummy variables for matched observations.

No significant difference was found in instructional costs per student unit in any of the three series of analyses after an upward revision in the state budgetary formula for instruction. However, as Figure 1 indicates, two years after the revision, per unit costs after inflation had begun to fall in both educational sectors, with

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Insert Figure 1 About Here

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decline sharper in the community college sector. Furthermore, per unit costs in both sectors were almost identical. Much of the reduction in per unit costs was achieved through the response of salary distress where educational inputs, in the form of faculty salaries, did not keep pace with the level of inflation.

As Table 3 shows, the use of stepwise regression analysis for all institutions identified seven significant instititutional predictor responses of per unit costs over the six-year period used in this study.

Insert Table 3 About Here

Those responses included: (1) the instructional expenditure proportion; (2) the staffing ratio; (3) the level of institutional complexity; (4) the amount of educational and general revenues; (5) the number of programs; (6) the interaction of time and sector; and, (7) the interaction of time and institutional complexity. There was overlap between the two educational sectors in significant explanatory variables selected. However there were four significant interaction variables selected for the senior-level institutions sector (See Table 4) These included: (1) the interaction of time and the staffing ratio; (2) the interaction of time and the nonlinear trend for size; (3) the interaction of time and average faculty salaries; and, (4) the interaction of time and the instructional expenditure proportion. On the other hand, as Table 5 demonstrates, there were no significant interaction variables selected

Insert Table 5 About Here

for the community college sector. Thus, relationships among these variables did not remain the same in the two sectors after a change in budgetary policy which reflected different institutional responses in the two sectors.

As institutions continued to grow in size, they continued t add faculty and programs. Thus, the level of institutional complexity remained approximately the same and remained linear to size beyond the threshold level of enrollment. The level of institutional complexity was also not significantly different after an upward revision in the budgetary formula for instruction. Institutions did not initially respond to revenue distress by eliminating marginal programs to support new or existing ones nor by retrenching faculty personnel. As Figure 2 shows, two years after the revision, the level of institutional

Insert Figure 2 About Here

complexity had begun to decline in both educational sectors, although the sharper decline occurred in the community college sector, when faculty and programs were not added proportionately to enrollment increases (See Figure 3). Relatedly, per unit instructional costs also concurrently declined.

Insert Figure 3 About Here

Discussion

The findings from this study offer base line data about institutional efforts to reduce per unit instructional costs in response to a policy change in a state budgetary formula. Public colleges and universities in Virginia did not immediately reduce their per unit instructional expenditures after an upward revision in the budget formula which triggered revenue distress conditions. However, as a result of institutional responses to revenue distress, per unit costs had begun to fall in both educational sectors two years after the budgetary adjustment. Therefore, institutional fixed commitments and institutional inertia delayed effective responses to distressed conditions. Initially, per unit costs continued to rise as institutions were slow to adapt and were not willing to retrench faculty. This finding did not support Bowen's (1980) revenue theory of cost which suggested that per unit instructional costs, which varied according to the amount of available institutional revenues, would have declined after an upward revision in the budget formula for instruction. His theory implied that institutions would be able to rapidly reduce their per unit costs. However, other researchers, such as Dickmeyer (1980), suggested that institutions could not quickly adapt to declining conditions which may have been partly attributed to initial institutional buffering to their core instructional function as identified by Zammuto (1984).

Per unit costs did decline two years after the budgetary revision which implied that institutions could eventually respond in a manner that reduced their per unit costs. As the period of revenue decline lengthened, institutions were more compelled to improve efficiency and also had more time to plan for such responses. Immediately after the policy change, most institutions were poorly equipped to manage decline and often chose responses such as salary distress that were counterproductive. When institutions realized that the decline was not temporary, they implemented efficiency responses to modify and/or adapt to this condition, perhaps with the intent of maintaining educational quality.

The necessary time to reduce instructional costs per student unit differed according to educational sector which reflected a different process of financial decision making in response to the same condition. The community colleges were heavily dependent on state revenues and had fewer sources of support which meant they should have been more vulnerable to a revenue decline. However, most of them continued to experience enrollment increases which meant that part of the decline in revenues was masked by additional achieved economies from scale that were respent. Furthermore, these institutions were smaller, and thus,more were initially buffered from the cutbacks implemented by the state. This also delayed their reduction in per unit costs.

The most significant predictor variable explaining the variance in per unit instructional costs was the instructional expenditure proportion. It was not strongly correlated with other predictor

variables. Despite this significance, its behavior differed according to sector. Larger community colleges spent more on the instructional function through respent savings for items such as additional faculty and programs rather than achieving economies of scale to lower per unit costs. However, the pattern was reversed for larger senior-level institutions. They spent less on the instructional functional item and more for research and public service, findings which paralleled Zammuto's (1984) results. Therefore, in order to reduce per unit costs in response to revenue distress, it is necessary to consider the behavior of this predictor variable by sector in relation to growth or decline in resources.

Institutional complexity was also a significant predictor of per unit instructional costs even though there was little reduction in this variable in response to revenue distress until two years after the budgetary revision. Public colleges and universities in Virginia did not initially retrench full-time faculty nor terminate programs in response to revenue distress without any budgetary incentive to encourage such activity. Thus, there was less reallocation of resources among programs than prescribed under revenue distress conditions as demonstrated by the addition of programs and the constant level of institutional complexity with scale beyond the threshold level. Nevertheless, a reallocation of resources was needed to adapt to a prolonged period of revenue distress. Therefore, this institutional reluctance to implement efficiency responses would make it more difficult for these institutions to continue to achieve valued objectives.

The initial response to revenue distress was salary distress which was not a significant predictor variable. Therefore, faculty lost purchasing power since their salary increases were less than the rate of inflation. In a state higher educational system, part of this distress was attributable to deficiencies in funding for salary increases. In addition, there was no institutional reduction in the level of full-time faculty. Furthermore, there was no major institutional increase in the student-faculty ratio nor in the threshold level which would have implied greater efficiency. Therefore, awarded salary increases were allocated to a growing number of faculty. Salary distress was more acute in the senior-level institutions sector, and there was a less pronounced reduction in per unit costs two years after the budgetary adjustment. Excess reliance on this response lowered the flexibility of the institution to respond under continued conditions of revenue distress.

The findings in this study supported those of McLaughlin, Montgomery, Smith, Mahan, and Broomall (1980) which suggested that institutional complexity, rather than size, was more significant in explaining the behavior of per unit instructional costs. The level of institutional complexity was higher in the community college sector since more of these institutions were smaller and below a threshold level of enrollment. Even though complexity had a linear relationship with scale beyond the threshold level, this variable did not reflect the cost of newly added programs. The findings from the analysis of all institutions indicated that new additions were more expensive to offer

since there was a positive correlation between per unit costs and the number of programs offered. However, this relationship was overshadowed by the threshold level of programs necessary to operate when other significant variables were controlled. Furthermore, part of the increased cost of newly added programs was eclipsed by respent economies achieved from scale.

Different predictor variables were significant in explaining the variance in instructional costs per student unit between the two sectors. Only the proportion of expenditures spent for instruction, the staffing ratio, and the level of institutional complexity overlapped. In the senior-level institutions sector, there were four significant interactions between predictor variables and time which suggested that the relationships of these variables differed after the change in the budgetary formula from different responses to revenue distress. This sector was spending a smaller proportion for instruction, which was the most significant predictor variable, in its attempt to curtail expenditures. The interaction of time and of the nonlinear trend for size was significant which indicated that the threshold level had increased. According to Maynard (1971), the staffing ratio influenced the increase in the threshold level and was increased in response to revenue distress which was partly achieved by increasing institutional size more than by the continued addition of faculty. Even though the staffing ratio was not significantly correlated with time, it significantly interacted with time to explain the change in the threshold level and the decrease in the instructional expenditure

proportion. Therefore, there was an additional range where economies of scale were achieved for this sector even though most institutions were beyond this new threshold level. In the community college sector, there were no significant interactions. Therefore, these independent variables were more sensitive to changes from responses in the senior-level institutions sector. Since certain responses may have affected nonsignificant independent variables in a particular educational sector, it was necessary to consider these differences when debating the implementation of prescriptive responses to revenue distress.

Since an institution's threshold level was affected by the staffing ratio, an increase in the staffing ratio should have extended the range of achieved economies, provided that institutional complexity remained constant. If institutions responded to revenue distress by cutting personnel and programs, then the threshold level would have changed. However, if institutional complexity remained constant to enrollment increases and if there were little change in the staffing ratio, then the threshold level would not have changed nor would there have been any greater achieved economies. The findings from this study for the community college sector indicated that neither the level of institutional complexity nor the staffing ratio significantly changed. Therefore, there were no notable differences in the threshold level of the institution and no significant interaction of time with the nonlinear trend for size. This supported Maynard's (1971) theorizing that, if no significant changes occurred in the staffing ratio, as well

as in complexity, the threshold level of institutions would not have been altered. Actually, a constant institutional complexity level worked against achieved economies and the response of salary distress. Only when institutional complexity declined two years after the budgetary adjustment did institutional efficiency responses succeed in reducing instructional costs per student unit.This suggested that institutional complexity had to be reduced, if institutions were to rapidly reduce their per unit costs.

By not reducing faculty some institutions maintained the same level of faculty in order to provide academic opportunity for their students. However, resources were thinly spread among programs, especially when equipment and supply purchases were postponed, part-time personnel were retrenched, and travel was eliminated in order to devote more resources to faculty salaries. This weakened priority programs that were pivotal in achieving institutional missions which did not meet this state's objective of providing high-quality programs. To fulfill this objective, weaker programs needed to be evaluated to determine if enough resources were available to support them without jeopardizing the quality of institutions' priority programs. Without any reduction in faculty, institutions lost flexibility to respond to future revenue and/or enrollment distress.

As institutional revenues declined as a result of the upward change in the budget formula, a smaller proportion of expenditures was devoted to instruction in response to this condition, especially in the senior-level institutions sector. Other functional areas, such as

administration or plant, with their fixed commitments, required a larger allocation of revenues. Therefore, less resources were devoted to the instructional function which was the core or primary mission of most educational institutions. This was an allocation decision in response to revenue distress which meant less academic resources were available to spend for educational programs.

The decision of the Commonwealth of Virginia to buffer smaller institutions from the immediate effects of revenue decline triggered by a change in budgetary policy was justified and necessary. Even though institutions spent all additional revenues raised, they had difficulty reversing the tide when revenues decreased. Smaller institutions were even more vulnerable to declining conditions since they were less flexible with a threshold level of programs and faculty that were necessary to effectively operate. Therefore, they had special difficulty implementing efficiency-related responses to revenue distress, such as retrenching faculty or terminating programs in the short-run.

Institutions have been criticized for being slow adapters to revenue distress conditions. The findings from this study supported this accusation since these institutions did not immediately curtail their instructional costs. Reliance on salary distress as a response to revenue distress, which was not a significant predictor variable, had its upper limits and reduced institutional flexibility to respond to further distress. Public institutions in Virginia were able to adapt to decline even though they did not employ all the responses that have been

prescribed, a factor which may have been attributed to limited budgetary discretion in public institutions and to fixed costs (Zammuto, 1984). Furthermore, they may have relied too extensively on short-range responses such as across-the-board budgetary cuts among programs without consideration for long-range implications.

One implication from the findings of this study was that the use of budget formulas brought standardization to the budgetary process. While admittedly an improvement over the pork-barrel allocation methods used in earlier years, formulas could lead to an impairment of quality in certain institutions if provisions were not included to recognize excellence and to reward performance. However, the use of formulas, with their provisions for equity and for a minimum amount of funding, also meant that institutions were not allowed to deteriorate to a marginal operation. Despite this fact, policy makers needed to assess the institutional performance which reflected their responses to revenue distress in order to determine if valued objectives were being fulfilled and to evaluate strategic adjustments in budgetary formulas after their implementation before developing other budgetary policy adaptations.

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TABLE 1

COMPOSITE INDEX FOR INSTRUCTIONAL EXPENDITURES

Fiscal Year	Personnel Compensation Subindex[a,c]	Total Contracted Services, Supplies, and Equipment Subindex[b,c]	Total Composite	Instructional Expenditures Index
1976	5.8	5.0	5.7	100.0
1977	5.1	5.9	5.2	105.2
1978	5.7	5.7	5.7	111.2
1979	6.5	7.0	6.6	118.5
1980	7.5	11.0	8.0	128.0
1981	8.9	11.2	9.3	139.9

[a]Weighted 84.6%

[b]Weighted 15.4%

[c]Data from Research Associates of Washington, 1982

TABLE 2

SIGNIFICANCE OF THE TIME PREDICTOR VARIABLE

AND THE MEANS OF DEPENDENT VARIABLES BY SECTOR

Dependent Variable	All Institutions	Community College Sector	Senior-Level Institutions
Per Unit Costs			
Before	945.74	945.77	945.70
After	954.08	971.18	926.73
Significance	(.613)	(.291)	(.320)
Instit. Complex.			
Before	1.6654	2.1205	0.9372
After	1.7091	2.1776	0.9595
Significance	(.116)	(.190)	(.254)

TABLE 3

STEPWISE REGRESSION OF INDEPENDENT VARIABLES' CONTRIBUTION TO THE PREDICTION OF INSTRUCTIONAL COSTS PER STUDENT UNIT FOR ALL INSTITUTIONS

Variable	B Value	Significance of Regression Coefficient	Incremental R^2	Total R^2
Intercept	-106.554	---	---	---
38 Dummy Variables	---	---	---	.7981
Inst. Percent	23.656	.001	.0808	.8789
Staff Ratio	-10.206	.001	.0318	.9108
Complexity	228.569	.001	.0213	.9321
E & G Revs.	0.001	.008	.0045	.9366
Programs	-3.660	.005	.0012	.9378
Time*Sector	43.192	.022	.0024	.9402
Time*Complex	9.334	.066	.0011	.9413

Note: The 38 dummy variables for cross-sectional observations were entered first or included to control the variance from repeated measures. Individual dummy variables were aggregated for the total R^2 contribution from them. Afterwards, 20 predictor variables were inputted into the stepwise regression analysis for selection.

$N = 234$; $F = 66.99$; $df = 45/188$; $p < .0001$

TABLE 4

STEPWISE REGRESSION OF INDEPENDENT VARIABLES' CONTRIBUTION TO THE PREDICTION OF INSTRUCTIONAL COSTS PER STUDENT UNIT FOR THE SENIOR-LEVEL INSTITUTIONS SECTOR

Variable	B Value	Significance of Regression Coefficient	Incremental R^2	Total R^2
Intercept	506.499	---	---	---
14 Dummy Variables	---	---	---	.8863
Complexity	152.823	.008	.0144	.9007
Staff Ratio	-22.143	.001	.0342	.9349
Time*Staff	13.640	.001	.0001	.9350
Time*Size Sq.	0.001	.005	.0060	.9410
Time*Avg. Sal.	-0.012	.009	.0008	.9418
Time*Inst. Pc.	-1.709	.116	.0001	.9419
Inst. Percent	18.724	.001	.0376	.9795
Grad. Percent	-7.896	.114	.0008	.9803

Note: The 14 dummy variables for cross-sectional observations were entered first or included to control the variance from repeated measures. Individual dummy variables were aggregated by the total R^2 contribution from them. Afterwards, 20 predictor variables were inputted into the stepwise regression analysis for selection.

$N = 90$; $F = 151.34$; $df = 22/67$; $p < .0001$

TABLE 5

STEPWISE REGRESSION OF INDEPENDENT VARIABLES' CONTRIBUTION TO THE PREDICTION OF INSTRUCTIONAL COSTS PER STUDENT UNIT FOR THE COMMUNITY COLLEGE SECTOR

Variable	B Value	Significance of Regression Coefficient	Incremental R^2	Total R^2
Intercept	-127.047	---	---	---
23 Dummy Variables	---	---	---	.7500
Inst. Percent	27.609	.001	.1057	.8577
Staff Ratio	-5.720	.043	.0410	.8967
Complexity	288.660	.001	.0268	.9235
E & G Revs.	0.001	.001	.0121	.9356
Programs	-10.952	.001	.0086	.9442
Avg. Salary	-0.032	.017	.0028	.9470

Note: The 23 dummy variables for cross-sectional observations were entered first or included to control the variance from repeated measures. Individual dummy variables were aggregated by the total R^2 contribution from them. Afterwards, 19 predictor variables were inputted into the stepwise regression analysis for selection.

$N = 144$; $F = 70.18$; $df = 29/144$; $p < .0001$

FIGURE 1

INSTRUCTIONAL COSTS PER STUDENT UNIT AFTER INFLATION FOR ALL INSTITUTIONS

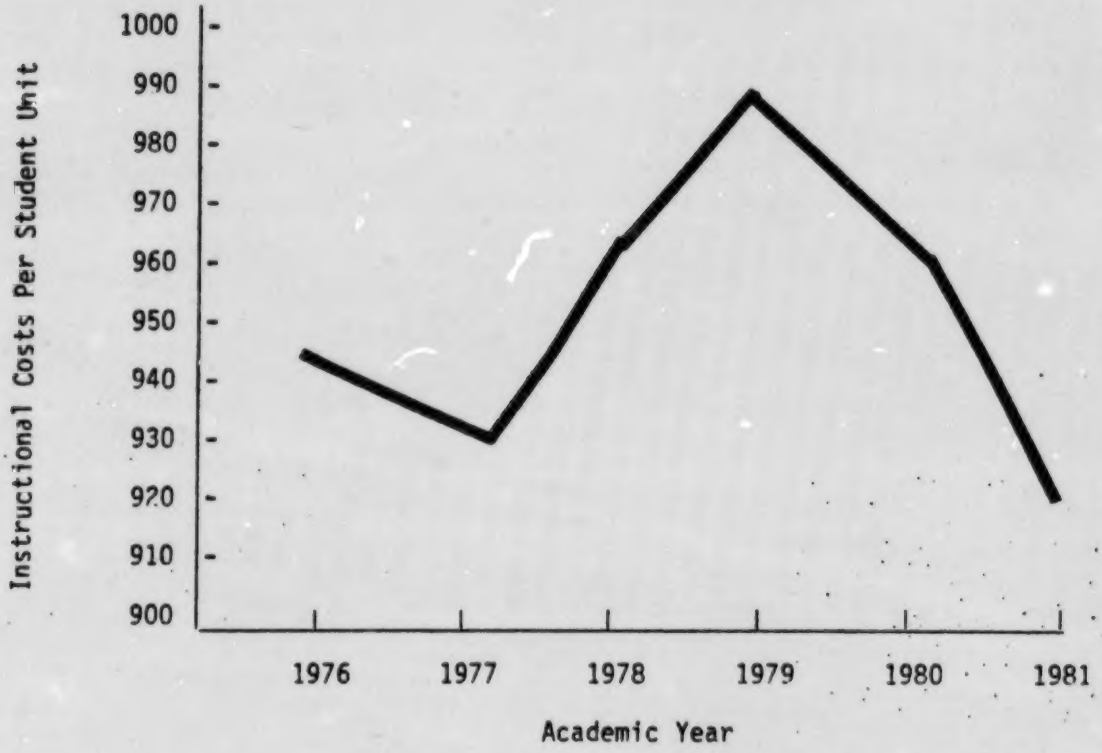

FIGURE 2

LEVEL OF INSTITUTIONAL COMPLEXITY FOR ALL INSTITUTIONS

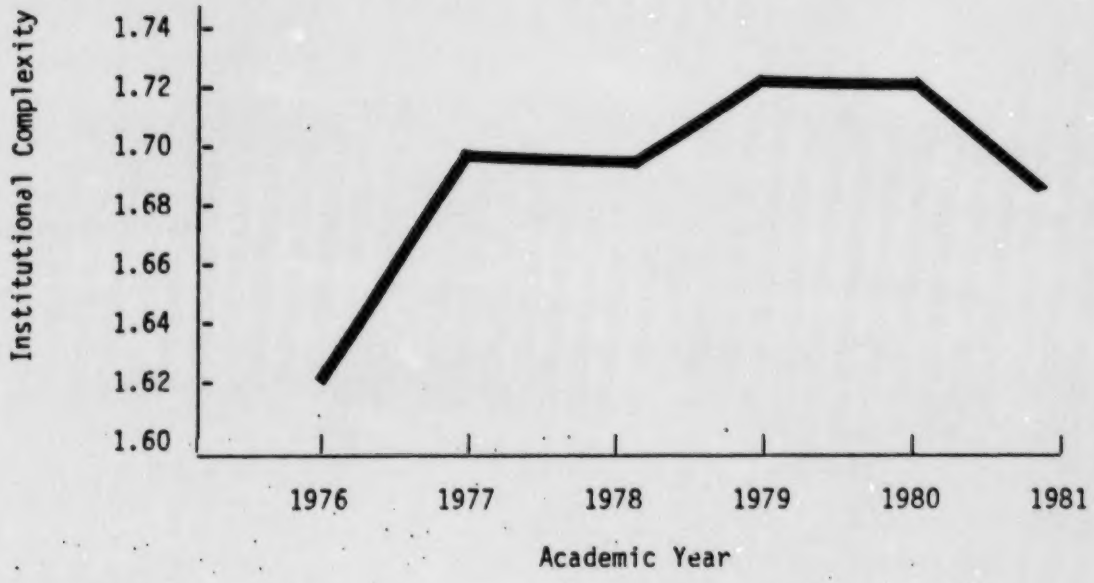

FIGURE 3

LEVEL OF INSTITUTIONAL COMPLEXITY FOR THE COMMUNITY COLLEGE SECTOR